

**REMARKS**

In this paper, claim 1 has been amended to recite “C: 0.16 to 0.25 %.” Support for this amendment can be found, for example, in claim 2 as originally filed and on page 4 of the originally-filed specification. No new matter has been introduced. Pursuant to MPEP § 706.07(h) and 37 CFR § 1.114, Applicants file herewith a Request for Continued Examination to reopen prosecution to have the amendment to claim 1 considered.

In the Office Action mailed on June 24, 2009, claims 1-9 were rejected under 35 U.S.C. § 103(a) as allegedly obvious in view of U.S. Patent 4,138,278 (hereinafter “Nakasugi”); claims 9-20 and 23 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable in view of the combination of Nakasugi and U.S. Patent 5,282,906 (hereinafter “Heitmann”); and claims 21 and 22 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable in view of the combination of Nakasugi, Heitmann, and an article entitled “The properties of high toughness low-temperature -70C steel 09MnNiDR” by Xiao Chen et al. (hereinafter “Chen”). In view of the amendments to the claims and the following remarks, Applicants respectfully request reconsideration and withdrawal of all rejections.

**35 U.S.C. § 103 Rejection of Claims 1-9**

Claims 1-9 were rejected on pages 2-3 of the Office Action as being obvious in view of Nakasugi. Applicants respectfully disagree because Nakasugi fails to teach or suggest all of the elements of Applicants’ independent claim 1.

Amended claim 1 is directed to a steel having the following composition in wt %:

0.16 to 0.25% C,  
0.10 to 0.30% Si,  
0.80 to 1.6% Mn,  
≤ 0.02% P,  
≤ 0.015% S, (the sum of P and S being ≤ 0.03%),  
0.40 to 0.80% Cr,  
0.30 to 0.50% Mo,  
0.70 to 1.20% Ni,  
0.020 to 0.060% Al,  
0.007 to 0.018% N,

0.02 to 0.07% Nb,  
remainder Fe, and inevitable impurities.

As such, the claimed steel must include 0.02 to 0.07% Nb and 0.16 to 0.25% C. (See amended claim 1; in addition, see for example, pages 3-5 of the originally-filed specification).

Nakasugi does not render amended claim 1 obvious because Nakasugi fails to teach or suggest Applicants' claimed 0.02 to 0.07% Nb and 0.16 to 0.25% C. For example, in contrast to Applicants' claimed steel, Nakasugi teaches a steel that does not include any Nb. Nakasugi explicitly contrasts its steel with Nb-steels:

"Further advantages of the present steel, are that;  
(1) there is no heating problem inherent to the Nb-steels because  
no Nb is contained, and a very stable balance can be obtained  
between the strength and the toughness..."

Nakasugi at col. 4, ll. 3-7, emphasis added. Therefore, not only does Nakasugi fail to teach a steel including Nb, but also Nakasugi discourages (i.e., teaches away from) the inclusion of Nb. Nakasugi goes further to explain why Nb is undesirable:

"Nb is an element which strongly prevents recrystallization of the rolled austenite grains (rolled  $\gamma$  grains) during the rolling so that below about 1050° C no satisfactory recrystallization proceeds."

Nakasugi at col. 1, ll. 63-66. As such, Nakasugi teaches away from Applicants' claimed Nb content.

The Examiner points to Nakasugi Table 2 and concludes that Nakasugi teaches "Nb: 0.0005-0.05%." Office Action at page 3. In addition, the Examiner reasons that col. 3, ll. 45-55 of Nakasugi supports modification of Nb content depending on the content of Mo (Office Action at page 7) and that even though "Nakasugi does not give a specific example of a steel falling within the claimed ranges, it would have been obvious to one of ordinary skill in the art at the time of the invention to have selected the overlapping portion of the ranges disclosed by the reference..." (Office Action at page 3). Applicants respectfully disagree for the following reasons.

Contrary to the Examiner's assertion, the only steel compositions in Table 2 of Nakasugi that include Nb are those which do not fall within the teaching of Nakasugi's invention. As an

initial matter, the only Nb-containing steels in Table 2, steels 9 and 12 are “Comparison” steels used by Nakasugi to compare and contrast “Present Invention.” The Examiner believes that the Nb content of Nakasugi’s invention can be modified in relation to the Mo content. That is, some of the Mo can be replaced with an increased Nb content. However, the disclosure of Nakasugi does not support a modification of the disclosed composition to Applicants’ claimed composition. For example, as discussed above, Nakasugi makes it quite clear that the present invention steels cannot have any Nb. Further, steels 9 and 12 (the comparison steels) has a C content (0.15% for steel 9 and 0.06% for steel 12) which does not fall within the claimed range (0.16-0.25%). In addition, steel 9 contains 0.45% Mo which is prohibited by Nakasugi (the upper limit of Mo is 0.40%; see Nakasugi at col. 4, ll. 39-40) as well as 0.02% Nb. As a result, steel 9 shows both an increased Mo and increased Nb which is opposite of the reason supplied by the Examiner for modification. Steel 12 (the other comparison steel including Nb) has 0.35% Mo, 0.04% Nb and 0.15% V, for a total of 0.54%; however, according to the Examiner, Mo, Nb and V contents are modified in relation to each other (i.e., to replace each other as they are similar), and thus Mo, Nb and V combined should not exceed the 0.40% upper limit for Mo. Because steel 12’s Mo, Nb and V total is 0.54%, it also fails to support the Examiner’s reason for modification to arrive at Applicants’ claimed steel.

Applicants further submit that one of ordinary skill in the art reading Nakasugi’s disclosure (steels 9 and 12 of Table 2) would not be motivated to modify the steel composition to include Applicants’ claimed Nb content, as the only disclosed steel compositions in Table 2 including Nb (steels 9 and 12) have undesirable properties. For example, these steels have a rolled  $\gamma$  grain size (ASTM No.) of 3.5 and 4.0, respectively. See Nakasugi at Table 2. This is below Nakasugi’s required rolled  $\gamma$  grain size as Nakasugi explicitly states: “It is necessary to refine further the heated austenite grains thus refined by rolling in the recrystallization zone into finer rolled austenite grains (not less than ASTM No. 6).” Nakasugi at col. 5, ll. 21-24, emphasis added. Furthermore, the 2mmV charpy impact properties and DWTT 85% SATT of steels 9 and 12 are also inferior to “Present Invention” steels 1-5. See Nakasugi at Table 2. For example, steel 9 has a vE-60° C value of 1.9 kg-m, which is significantly lower than those of

steels 1-5 (ranging from 10.8 to 20.3 kg-m). Therefore, Nakasugi's Table 2<sup>1</sup> does not provide any teaching or suggestion for providing 0.0005-0.05% Nb content, as one of ordinary skill in the art in view of Nakasugi's disclosure of eliminating Nb from the Present Invention combined with Nakasugi's disclosure of the poor properties of steels including Nb, would not have modified any of the disclosed steel composition in Nakasugi to arrive at Applicants' claimed composition.

In addition to Nakasugi's failure to teach or suggest Applicants' claimed Nb content, Nakasugi also fails to teach or suggest 0.16 to 0.25% C. Instead, according to Nakasugi at col. 6, ll. 51-59, the upper limit of Nakasugi's C content is 0.13%:

"when the carbon content is excessively large, a large amount of bainite and island martensite is formed even with Mo contents within the range from 0.80 to 0.40% to have adverse effects on the toughness and to lower the weldability. Thus the upper limit of the carbon content is set at 0.13%. In order to eliminate the adverse effects on the toughness of the segregation zone, not more than 0.1% of carbon is desirable."

Therefore, this limitation (no greater than 0.13% C) provides a disincentive for one of ordinary skills in the art to increase the C content above 0.13%, and thus teaches away from Applicants' claim 1.

Because none of the steels described in Nakasugi include each and every limitation of Applicants' amended claim 1, and further because Nakasugi teaches away from Applicants' claimed Nb and C contents, Applicants respectfully submit that Nakasugi fails to support a 35 U.S.C. § 103 rejection of claim 1 or any claim depending therefrom. Accordingly, Applicants request that the 35 U.S.C. § 103 rejection of claims 1-9 be reconsidered and withdrawn.

### **35 U.S.C. §103 Rejection of Claims 9-23**

Claims 9-20 and 23 were rejected on pages 3-5 of the Office Action as being unpatentable in view of the combination of Nakasugi and Heitmann. Claims 21 and 22 were rejected on page

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<sup>1</sup> Applicants note that Table 1 steels G-1 to G-4 and Table 3 steel 12, while containing Nb, also fall outside of Nakasugi's invention because these examples have undesirable rolled γ grain size (below ASTM No. 6), as well as unfavorable 2mmV charpy impact properties and DWTT 85% SATT. See Nakasugi at Tables 1 and 3.

6 as being unpatentable in view of the combination of Nakasugi, Heitmann and Chen.

Applicants respectfully disagree.

Claims 9-23 are dependent upon Applicants' amended independent claim 1. As a result, in order for claims 9-23 to be unpatentable in view of the combination of references each and every element of claim 1 must be taught or suggested by the combination. As discussed above, Nakusugi fails to teach or suggest every element of claim 1. Heitmann and Chen do not remedy Nakusugi's deficiencies. For example, the references combined still fail to teach or suggest Applicants' claimed C content of 0.16-0.25%. Nakasugi discloses C content no greater than 0.13% as discussed above. Heitmann requires carbon to be in the 0.40-0.50% range. Heitmann at col. 2, l. 53 and col. 5, ll. 17-19. Heitmann also states the importance of such carbon content at col. 4, l. 68 to col. 5, l. 2: "The minimum quenching rate necessary to produce the desired microstructure will depend upon the composition, particularly the carbon content of the steel..." On the other hand, Chen requires C content not exceeding 0.12%. Chen at Table 1. Thus, Nakasugi, Heitmann and Chen, alone or in combination, fail to teach or suggest every element of Applicants' claim 1.

Applicants also submit that one of ordinary skill in the art would not have combined Nakasugi, Heitmann and Chen to arrive at Applicants' claims as Nakasugi teaches away from Applicants' claimed Nb and C contents. Because Nakasugi makes it clear that Nb is to be avoided and C is to not exceed 0.13%, Applicants respectfully submit that Nakasugi can not be used as a primary reference to support a 35 U.S.C. § 103 rejection, as any modification of Nakasugi to include Nb or to increase C content above 0.13% is discouraged and therefore not available for use to support an obviousness type rejection.

Accordingly, Applicants respectfully request that the 35 U.S.C. § 103 rejection of claims 9-20 and 23 based on Nakasugi and Heitmann be reconsidered and withdrawn. Applicants also seek reconsideration and the removal of the 35 U.S.C. § 103 rejection of claims 21-22 based on Nakasugi, Heitmann and Chen.

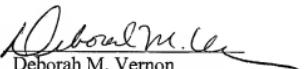
**CONCLUSION**

Applicants respectfully submit that all of the pending claims are in condition for allowance and requests early favorable action. If the Examiner believes a telephonic interview would expedite the prosecution of the present application, the Examiner is welcome to contact Applicants' Attorney at the number below.

Respectfully submitted,

Date: December 23, 2009  
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